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PHNL 000307
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JC978 U.S. PTO
09/866439
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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. Patent application No. Demande de brevet n°

00201909.9

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

I.L.C. HATTEN-HECKMAN

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

Anmeldung Nr.:
Application no.:
Demande n°: 00201909.9

Anmeldetag:
Date of filing:
Date de dépôt: 30/05/00

Anmelder:
Applicant(s):
Demandeur(s):
Koninklijke Philips Electronics N.V.
5621 BA Eindhoven
NETHERLANDS

Bezeichnung der Erfindung:
Title of the invention:
Titre de l'invention:
Method and apparatus for allocating recording space on a recording medium

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

Staat:
State:
Pays:

Tag:
Date:
Date:

Aktenzeichen:
File no.
Numéro de dépôt:

Internationale Patentklassifikation:
International Patent classification:
Classification internationale des brevets:

/

Am Anmeldetag benannte Vertragsstaaten:
Contracting states designated at date of filing: AT/BE/CH/CY/DE/DK/ES/FI/FR/GB/GR/IE/IT/LI/LU/MC/NL/PT/SE/TR
Etats contractants désignés lors du dépôt:

Bemerkungen:
Remarks:
Remarques:

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Method and apparatus for allocating recording space on a recording medium

EPO - DG 1

30. 05. 2000

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The present invention relates to a method and apparatus for allocating recording space on a recording medium. More specifically, the present invention relates to a method for allocating recording space on a recording medium for recording an entry of a predetermined length, the recording medium having a directory associated with it, the

5 directory listing blocks indicating free space and previously recorded entries, comprising the steps of receiving a start position on the recording medium, determining the consecutive blocks from the directory necessary for recording at least the entry of the predetermined length, starting from the start position and displaying the directory.

In a further aspect, the present invention relates to a module for allocating

10 recording space on a recording medium for recording an entry of a predetermined length comprising memory means for storing a directory associated with the recording medium, the directory listing blocks indicating free space and previously recorded entries, and processing means connected to the memory means for receiving a start position on the recording medium, and determining the consecutive blocks necessary for recording at least the entry of

15 the predetermined length, starting from the start position.

The present invention relates to recording media, such as linear recording media in which information can only be accessed sequentially. The recording media may, e.g. be audio tape, video tape, both for recording information in an analog or digital manner, or other data storage media, e.g. for use in computer applications. The recording medium in

20 all these cases is magnetic tape, which is a low cost medium compared to media for random access devices.

Alternatively, the recording medium may be a random access recording medium, being used to record data or information in a sequential format. In this case, the data or information may physically be located on non-sequential parts of the recording medium.

25 Document WO 93/04473 discloses a method and system for providing a program directory on a video tape cassette. The directory lists programs recorded on the cassette tape, and is provided to facilitate allocation and de-allocation of space on the tape for recording purposes. The directory may be stored on the tape itself or in an external memory. A user of a video recorder can use the directory to assign a space on a video tape for

recording of a certain program. This may be a free space of sufficient length for the program to be recorded. It is also possible to indicate in the directory, that a certain program may be overwritten, without the need to actually erase the program on the tape. For that, the entry in the directory is indicated as free space. A tape recorder is fitted with a directory controller including a microprocessor, a memory and a directory input/output keyboard and display device.

The directory may be displayed on a dedicated screen, or on the TV-screen (On-screen display) in the form of a number of lines, each line representing a recorded program or a free space. The user can select one of the lines, representing either a free space or a previously recorded program, as start position for recording a new program. Alternatively, the user can enter a program to be recorded and the recording time needed, and the video recorder will then use a search algorithm to find a free space on the tape large enough to record the program. The search algorithm can also be implemented to find an optimal free entry, e.g. one whose length is closest to the length of the program to be recorded.

When there is not enough space on the tape, the user is notified in a next screen, that subsequent program entries on the tape will be written over when the recording is actually performed.

A disadvantage of this system is that the user is only notified on a next screen that the program that he wants to record will overwrite a previously recorded program. If the user wants to prevent this, he needs to switch back and forth between several screens in a trial-and-error manner to find a start position for the recording which will only overwrite recorded programs he is not longer interested in keeping.

Document WO 95/18449 discloses a further enhancement of the method and apparatus disclosed in WO 93/04473. In this document, a method is disclosed comprising the steps of warning the user when a number of already recorded programs will be written over when the program to be recorded is started at the indicated start position. The warning is in the form of a further screen presented to the user and lists the number and program title of the recorded programs that will be written over.

This system has basically the same disadvantage as the earlier described system, in that the user will have to switch back and forth between various screens to find an optimum solution for recording a program with a predetermined length.

The present invention tries to provide a method and system for allocating recording space on a recording medium which do not show the disadvantages mentioned.

In a first aspect, the present invention provides a method according to the preamble of claim 1, in which the method comprises the further step of indicating the consecutive blocks in the displayed directory.

By executing this method, a user will directly be informed which program
5 entries and free spaces on a recording medium will be used for recording a new entry of a predetermined length from a start position on the recording medium.

The start position may be determined by a search algorithm or by receiving the start position input, e.g. from a user. When a user enters a new start position, e.g. by using up/down arrow keys on a keypad, the method will immediately recalculate the consecutive
10 blocks in the directory needed for the recording of a new entry, enabling a very direct interaction with the user. The user is in a better position to intuitively determine the best possible solution for allocating recording space for a new entry, taking into account the other previously recorded entries on the recording medium and their relative importance to the user.

15 Preferably, the directory is displayed in a text-only format, allowing very easy implementation of the method. The consecutive blocks may be indicated such that they are discernably from the rest of the displayed directory, e.g. by either displaying a frame around the consecutive blocks, highlighting or underlining the consecutive blocks, or by a colour, font, character size or typography different from the other directory blocks. All these
20 alternatives are easy to implement using known means.

The entry to be recorded may be related to recording a program on video tape, in which case the predetermined length relates to an amount of recording time. Alternatively, the entry to be recorded may relate to recording data (e.g. recording instrumentation data) and in that case, the predetermined length relates to an amount of data.

25 In a further embodiment of the present method, the method comprises the further step of calculating the difference of the length of the consecutive blocks and the predetermined length, and displaying the difference. This may aid the user in determining the optimum solution for the allocation of recording space.

In a further aspect, the present invention provides a module according to the
30 preamble of claim 9 as defined above, in which the processing means are further arranged to indicate the consecutive blocks in the directory. The module may form part of a video recorder system, or another recorder system using a recording medium, such as an instrumentation data recorder. The processing means of the module according to the present

invention can be advantageously arranged to implement the method according to the present invention.

In a still further aspect, the present invention relates to a computer program product comprising data and instructions to be loaded by a computer, providing the computer with the capability to carry out the method according to the present invention. Furthermore, the invention relates to a data carrier provided with a computer program product according to the present invention.

The present invention will now be discussed in further detail by means of exemplary embodiments with reference to the accompanying drawings in which:

10 Figure 1 shows a block diagram of a video recorder system connected to a TV-set, the video recorder system incorporating a module according to an embodiment of the present invention;

Figure 2 shows a flow diagram illustrating the method according to an embodiment of the present invention; and

15 Figures 3a - 3d show illustrations of the directory as displayed according to the present invention.

In Figure 1, a block diagram is shown of a video recorder system 10 connected to a TV set 11. The video recorder system 10 comprises a module 12 for allocating space on a recording medium, such as a video tape, according to the present invention. The module 12 may be a separate item interfacing with the other electronics in the video recorder system 10, or may be implemented as part of the common control electronics in the system 10. The video recorder system 10 further comprises conventional recording/ display means 17, comprising amongst others the video tape head and associated control means, and output means for delivering a video signal to the TV set 11. The module 12 comprises processing means 14, memory means 13 connected to the processing means 14. In a further embodiment, the module 12 further comprises interface means 15 connected to the processing means 14 for interfacing with a remote control 16. The module 12 may form part of the video recorder system 10.

In this description, the general term processing means 14 are used to indicate a calculation unit processing data, such as a computer under control of software and associated electronics. It can relate to a single processor or multiple processors, or a processor working in parallel to execute multiple methods or programs. The memory means 13 may be one of known memories, such as RAM, EEPROM or other rewritable memories.

The memory means 13 comprise data regarding the directory 30 of the video tape which is present in the video recorder system 10. These data may alternatively be comprised on the video tape itself, or on a separate storage means on the video tape cassette.

The processing means 14 are arranged for receiving a start position on the video tape, either from the conventional recording/ display means 17, or via user input. This user input may be achieved, e.g., by pressing keys on the remote 16 via the interface means 15. The processing means 14 are further arranged to determine the number of consecutive blocks from the directory 30 necessary for recording a new program, starting from the start position. Furthermore, the processing means 14 are arranged for displaying the directory 30 and indicating the number of consecutive blocks in the directory 30, preferably by controlling the conventional recording/display means 17 and the TV set 11 (On screen display).

Alternatively, the processing means 14 may receive data entered by the user via a keyboard or buttons on the video recorder system 10. Also, the directory 30 and indication of blocks in the directory 30 needed may be displayed on a separate display, e.g. on the remote 16, via the interface means 15.

Figure 2 shows a flow diagram of the method according to the present invention, as executed by the processing means 14. Alternatively, the present method is implemented using the processing, memory and display means already present in a modern video recorder system 10. The method according to the present invention may form part of the normal programming method of a conventional video recorder 10. In block 20, the method of the present invention receives the directory 30 of the video tape present in the video recorder system 10, the title of the program to be recorded and the time period needed for the recording. The directory 30 comprises in sequential form entries on the tape, which may be blocks of free space or previously recorded programs, including the associated time periods. In an alternative embodiment, the directory 30 may also comprise index numbers. In block 21, the start position on the video tape is received, referenced to the entries in the directory 30. This may be accomplished using a search algorithm for allocating space equal to the time period to be recorded on the video tape, such as known from WO 93/04473 or WO 95/18449. Alternatively, the user provides the start position, e.g. by using up/down or numeric buttons on the remote control 16.

In block 22, the consecutive blocks needed for the program to be recorded are determined, taking into account the start position, the time periods associated with the blocks in the directory 30 and the length of the new program to be recorded. In block 23, this directory 30 is displayed to the user, e.g. by an on-screen display on the TV-set 11. The

consecutive blocks in the directory 30, needed for recording of the new program are indicated in the directory 30 in block 24, e.g. either by putting a frame 31 around the consecutive blocks, by highlighting the consecutive blocks or by using a different colour form the other entries in the directory 30.

5 In a further embodiment, the method comprises the further step of calculating the difference of the length of the consecutive blocks and the predetermined length, and displaying the difference (step 27). This may aid the user in determining the optimum solution for the allocation of recording space.

10 In block 25, the user can accept the provisional programming of the new recording as indicated by the present method. If the user accepts the present programming, the method proceeds as usual for the recording of programs. If the user is not satisfied with the selection, the method returns to block 21, and the user may select a new start position, e.g. by pressing up-down arrow keys on his remote control 16, or by selecting an index number from the directory 30.

15 As an example, Figures 3a - 3d show a directory 30 as presented to a user when he wants to record a program Prog 5 of 1 hour and 30 minutes on a video tape already containing previously recorded programs Prog 1 - Prog 4. In a sequential manner, the directory 30 of a four hour video tape is shown in Figure 3a. The tape contains four previously recorded programs Prog 1 - Prog 4, in which Prog 1 - Prog 4 may, e.g., be the
20 titles of the programs. The directory 30 also lists the free spaces available on the tape (here 15 and 22 min.). Furthermore, the length of each entry (program or free space) is shown to the left.

When the user has entered the title of the program to be recorded and its length in hours and minutes, the method according to the present invention may execute a search
25 algorithm to find the most appropriate start position for the recording of the program. In this case, it is found that the most ideal start position would be the start of Prog 4, using the longest free space on the tape, and only sacrificing one previously recorded program. This is indicated in the directory 30 by a frame 31 around the entries in the directory 30 that will be used for the recording.

30 According to the present method, the user may alter the choice of the start position for the recording of the new program. This may be accomplished by a single keystroke on the remote control 16 for the video recorder, e.g. by using an up-arrow key. After selection of the key, the method determines once again which entries in the directory 30 are needed to be able to record the new program entirely. This is indicated in Figure 3b,

where the start position for the recording is shifted to the start of Prog 3. The method determines the allocation for the new program, shown by the frame 31 around Prog 3 and Prog 4 in the directory 30, which together provide enough space for the new recording.

However, the user may want to keep the recording of Prog 4, and again selects
5 the up-arrow key. Once again, the method determines the allocation of space on the tape needed for the new program, and indicates the new selection in the directory 30. In Figure 3c it is shown that in this case, the entries of Prog 2, the free space of 15 minutes and Prog 3 are needed to allow complete recording of the new program. When the user agrees to losing previous recordings Prog 2 and Prog 3, he can accept the selection made at this point, and the
10 new program will be recorded after Prog 1 on the video tape.

Figure 3d shows how in this case the directory 30 will be presented after the new program has been recorded. It is clear that the new program Prog 5 has been recorded after Prog 1, and that a free space of 10 minutes is still available after the recording of Prog 5. In an alternative embodiment, the directory 30 of Figure 3d may also be displayed before the
15 actual recording of the new program, e.g. indicated by the further indication -preliminary-.

For the person skilled in the art it will be clear that the start position as described above, may also be used as the end position, denoting the end of a recording. In that case, the present method will determine which entries in the directory before the end position are necessary to enable the desired recording.

20 Using the present invention, the user can in a very easy way observe the various possibilities for allocating space for a new recording, enabling to come to the best solution in a very intuitive way, taking into account the previously recorded programs and their relative importance.

The present invention has been illustrated by reference to a video recorder
25 system 10 and its operation. However, it will be clear that the present invention can also be applied to other recording means, such as instrumentation data recorders. Moreover, the present invention can also be applied using other recording media, e.g. random access recording media such as a hard disk.

In the case of a hard disk, data or information may be recorded using files on
30 the hard disk, as in a personal computer. When separate files are stored on the disks as a sequence of blocks, the hard disk is virtually a linear recording medium. The blocks forming the file may, however, also be recorded physically spread over the hard disk. The present invention may then be used for the directory of the files. The user may use the frame 31 to indicate the files which can be overwritten for a new recording.

In this case, the free blocks are preferably not indicated in the directory. When a user want to record a program of two hours, and free blocks are present having a recording capacity of one hour, the frame 31 will now indicate consecutibe programs having a recording capacity at least one hour. When recording, the free blocks will be used first, after
5 which the programs selected by the frame 31 are overwritten.

CLAIMS:

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1. Method for allocating recording space on a recording medium for recording an entry of a predetermined length, the recording medium having a directory (30) associated with it, the directory (30) listing blocks indicating free space and previously recorded entries, comprising the steps of

5 receiving a start position on the recording medium (step 21);
determining the consecutive blocks from the directory (30) necessary for recording at least the entry of the predetermined length, starting from the start position (step 22); and
displaying the directory (step 23), **characterized in that** the method comprises the further step of indicating the consecutive blocks in the displayed directory (step 24).

10

2. Method according to claim 1, in which the start position is determined by a search algorithm.

3. Method according to claim 1, in which the start position is determined by

15 receiving start position input from a user.

4. Method according to claim 1, 2 or 3, in which the directory (30) is displayed in a text-only format.

20 5. Method according to one of the preceding claims, in which the consecutive blocks are displayed discernably from the rest of the displayed directory.

6. Method according to claim 5, in which the consecutive blocks are indicated by either displaying a frame (31) around the consecutive blocks, highlighting or underlining the
25 consecutive blocks or by a colour, font, character size or typography different from the other directory blocks.

7. Method according to one of the preceding claims, in which the predetermined length relates to an amount of recording time.

8. Method according to one of the preceding claims, in which the predetermined length relates to an amount of data.

5 9. Method according to one of the preceding claims, in which the method comprises the further step (step 27) of calculating the difference of the length of the consecutive blocks and the predetermined length, and displaying the difference.

10 10. Module (12) for allocating recording space on a recording medium for recording an entry of a predetermined length comprising memory means (13) for storing a directory (30) associated with the recording medium, the directory (30) listing blocks indicating free space and previously recorded entries; and processing means (14) connected to the memory means (13) for receiving a start position on the recording medium, and determining the consecutive blocks necessary for recording at least the entry of the predetermined length, starting from the start position,
15 **characterized in that** the processing means (14) are further arranged to indicate the consecutive blocks in the displayed directory (30).

11. Module (12) according to claim 10, in which the processing means (14) are
20 arranged to determine the start position by a search algorithm.

12. Module (12) according to claim 10, in which the processing means (14) are arranged to receive the start position input from a user.

25 13. Module (12) according to claim 10, 11 or 12, in which the processing means (14) are further arranged for displaying the directory (30) in a text-only format.

14. Module (12) according to one of the claims 10 through 13, in which the processing means (14) are further arranged for displaying the consecutive blocks discernably
30 from the rest of the displayed directory.

15. Module (12) according to claim 14, in which the processing means (14) are further arranged for indicating the consecutive blocks by either displaying a frame (31)

around the consecutive blocks, highlighting or underlining the consecutive blocks, or by a colour, font, character size or typography different from the other directory blocks.

16. Module (12) according to one of the claims 10 through 15, in which the
5 processing means (14) are further arranged for calculating a difference of the length of the consecutive blocks and the predetermined length, and for displaying the difference.
17. Video recorder system (10) comprising a module (12) according to one of the
10 claims 10 through 16.
18. Computer program product comprising data and instructions to be loaded by a
computer, providing the computer with the capability to carry out the method according to
any of the claims 1 through 9.
- 15 19. Data carrier provided with a computer program product according to claim 18.

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ABSTRACT:

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Method and module for allocating recording space on a recording medium for recording an entry of a predetermined length, the recording medium having a directory (30) associated with it, the directory (30) listing blocks indicating free space and previously recorded entries, comprising the steps of receiving a start position on the recording medium (21), determining the consecutive blocks from the directory (30) necessary for recording at least the entry of the predetermined length, starting from the start position (22), displaying the directory (23) and indicating the consecutive blocks in the directory (24), e.g. by a frame (31) around the consecutive blocks. The module may advantageously be incorporated in a video recorder system (10) or another recorder system using recording media.

10

Figure 3c

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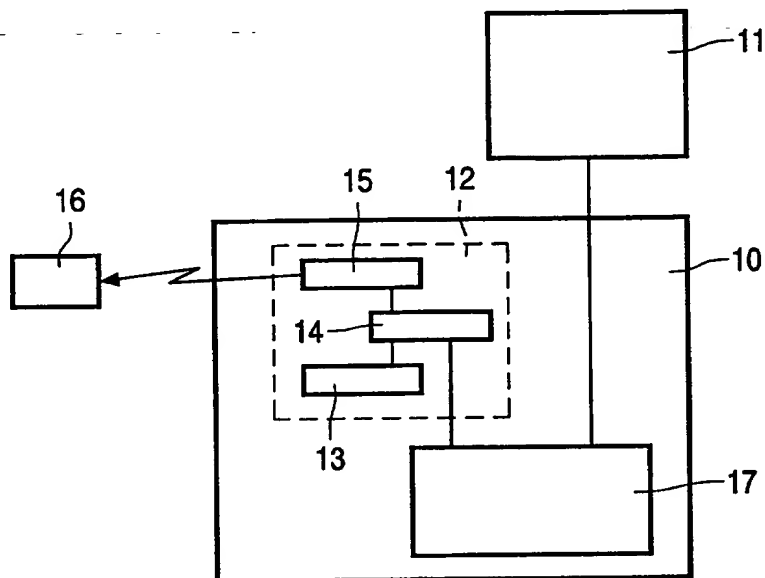


FIG. 1

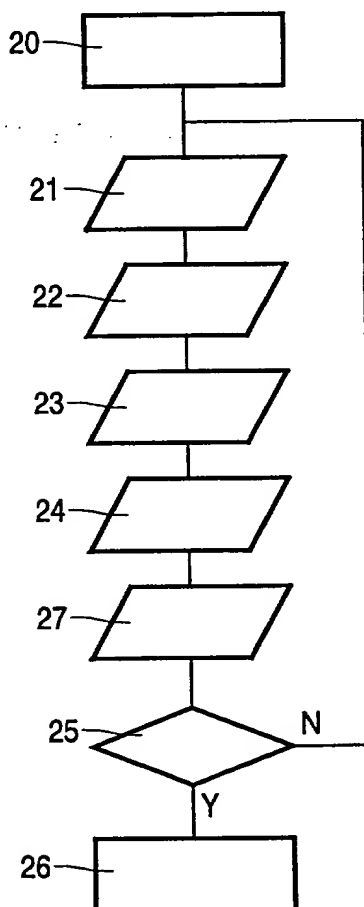


FIG. 2

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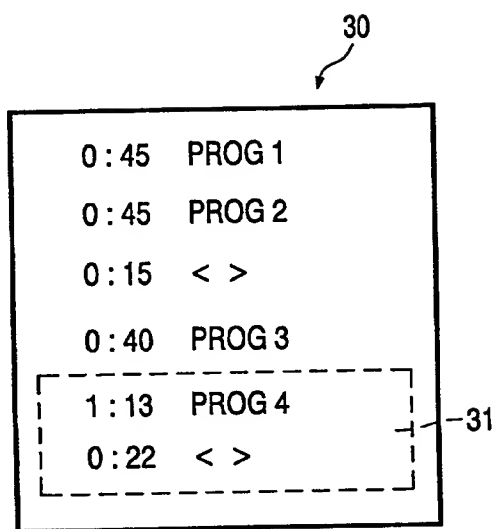


FIG. 3a

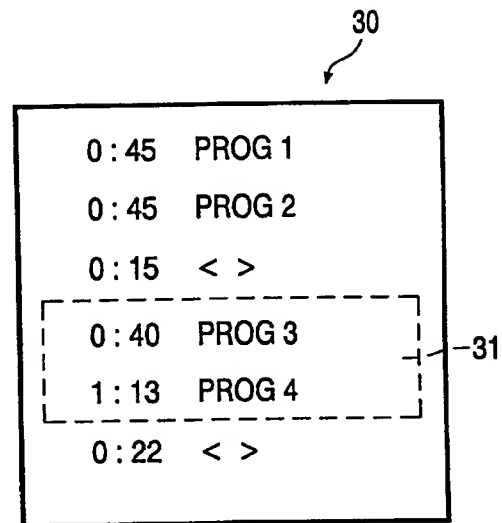


FIG. 3b

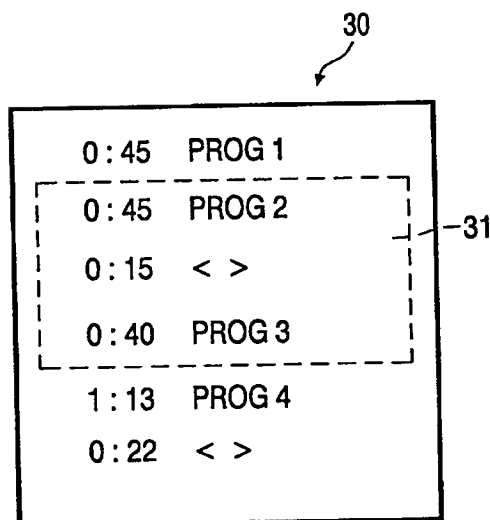


FIG. 3c

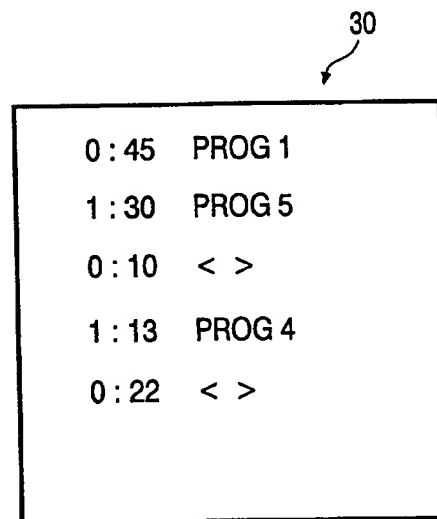


FIG. 3d